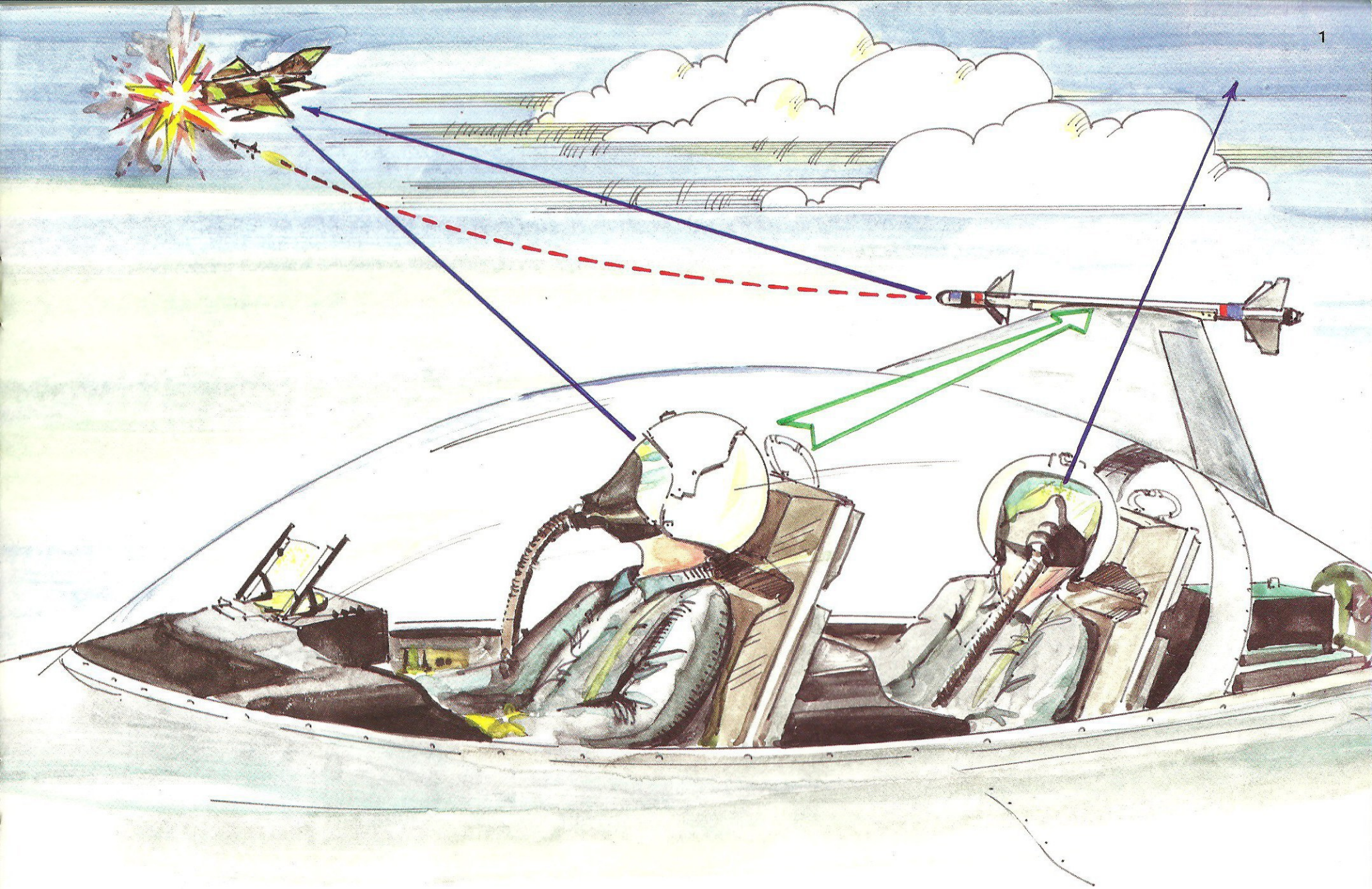
DASH

Display And Sight Helmet

Elbit
COMPUTERS LTD.

The tale of a unique air superiority system



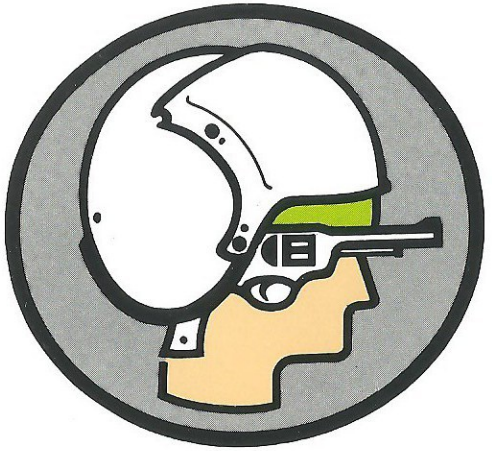
Introduction

Elbit's Display and Sight Helmet System (DASH) is designed to enhance overall performance and achieve superiority in air-to-air combat.

DASH development began four years ago. After extensive combat experience it became clear that the greater the number of battle participants, the more acute the need for the pilot to be "quick on the trigger" and launch ammunition as rapidly as possible, during tense, quick-changing situations where opportunities appear and disappear in seconds.

As system development progressed, further capabilities were added to assist the pilot in an entirely different but equally demanding task - attacking ground targets.

This booklet is designed to present a clear picture of DASH - Elbit's advanced avionic system ensuring air superiority.



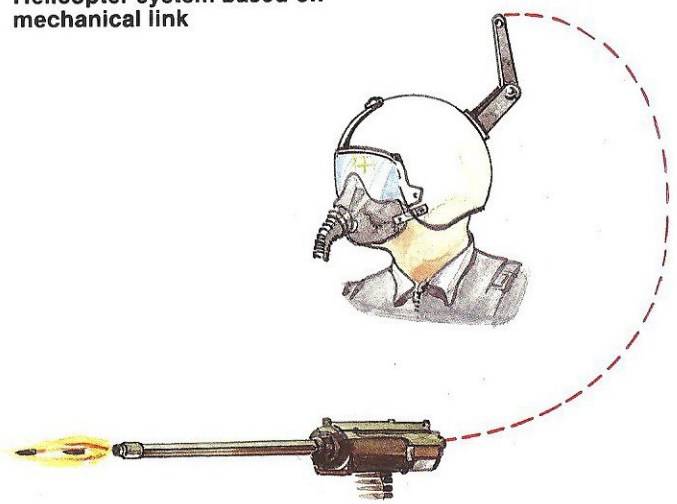
Background

The concept of a helmet mounted sight first surfaced after intensive air-to-air combat in southeastern Asia. The idea was to exploit the pilot's line of sight (head direction - not eye), for the purpose of directing aircraft systems (radar, missiles) to the target and locking them on it.

Unlike other systems installed in helicopters and based on a mechanical link between the pilot's head and aircraft systems, effective operation in the fighter cockpit is achieved when based on the electromagnetic principle which is the core of our system, DASH.

DASH development was a major undertaking.
It was necessary to overcome several difficulties inherent in producing an operational system demanding a high degree of precision - 1° to be exact. The engineering achievement is both optical and electromagnetic, and in a harsh environment - the fighter cockpit.

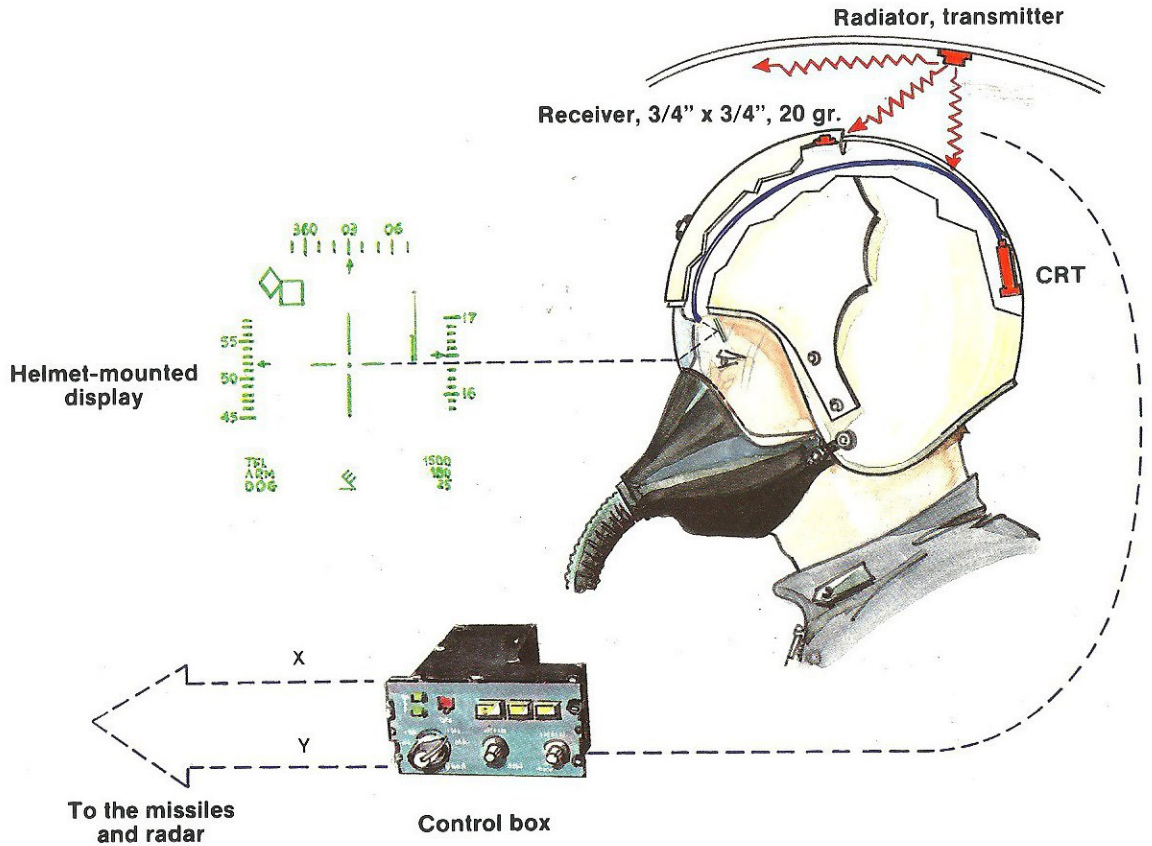
Helicopter system based on mechanical link



Determining the Pilot's Line of Sight

Several approaches to this task, among them electro-optic technology (cameras and helmet-mounted reflectors), and even acoustical devices were considered.

The advantage of the electromagnetic principle however, lies in the volume offered by the "head movement box" - that is, the unrestricted movement of the pilot's head inside the cockpit.

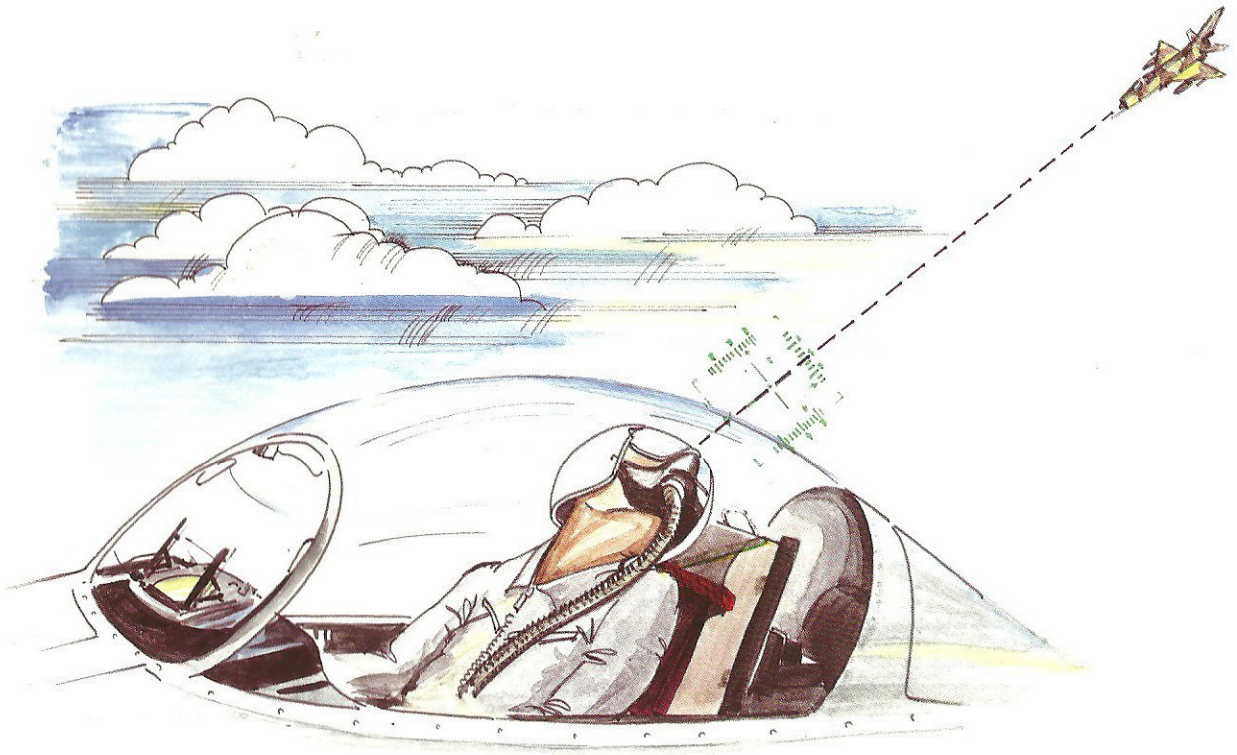


DASH development naturally led to reconsideration of the helmet's role. Is it merely a protective shield for the pilot's head, or should it be regarded as an innovative device -one that can enhance the operational performance of the pilot.

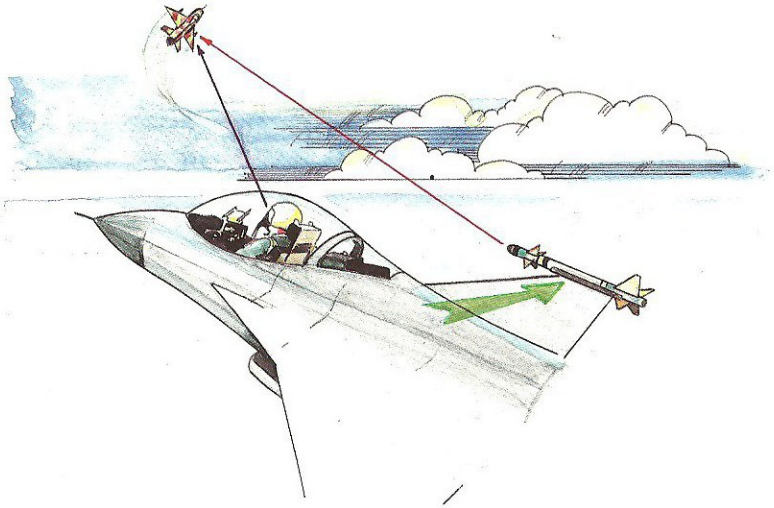
This in turn led to the idea of a helmet mounted display. Why indeed should the pilot be confined to the instrument panel as the sole source of vital information and flight data? Why not bring the entire HUD system into the pilot's field of view -namely, onto the helmet visor.

Equipped with DASH, the pilot is free to turn his head in all directions without the need to glance inward at the instrument panel.

Vital information such as flight and navigational data, threats in the area, weapon system status, is presented on the helmet visor. At the same time, he can designate targets or receive cueing information from the radar and INS systems.

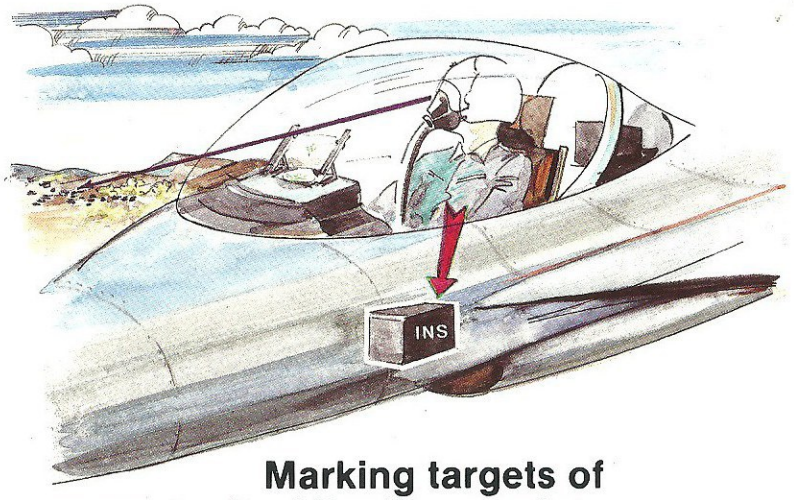


The pilot designates targets



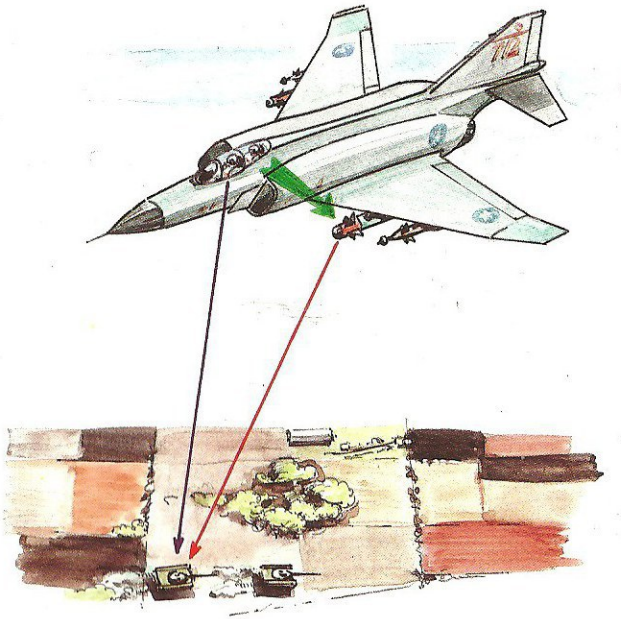
Designating A-A missile/airborne radar

Without directing the nose of the aircraft towards the target. This enables quick launching in encounters with multiple opponents.



Marking targets of opportunity / Position update

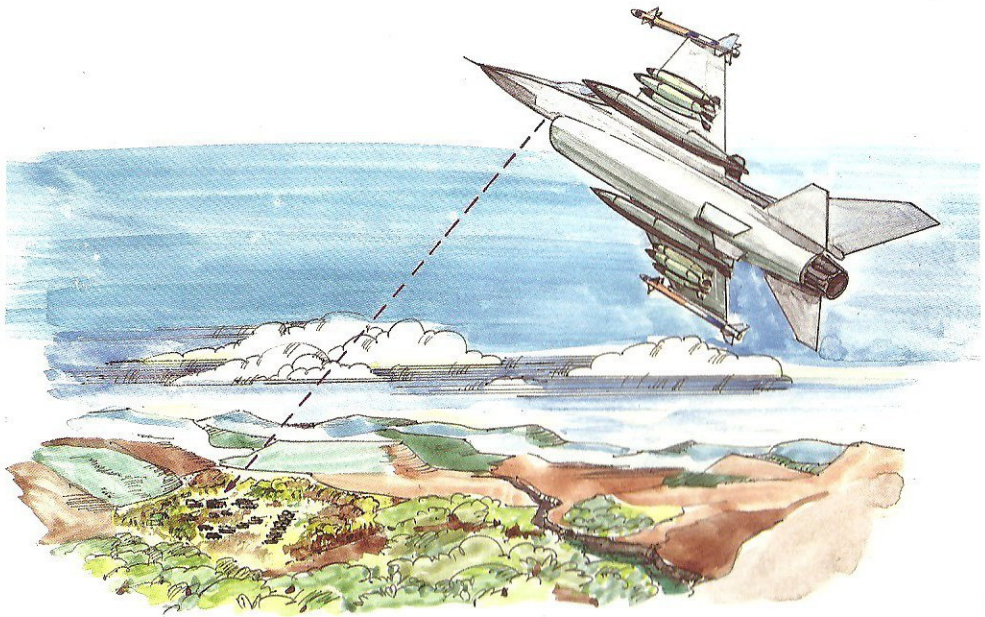
When at "offset" the pilot designates targets of opportunity and updates the navigation system.



Designating E.O. Pods / E.O. Missiles

Enables swift, smooth reaction in harsh weather/threat conditions, which is almost a prerequisite for weapon operation in single-seat aircraft.

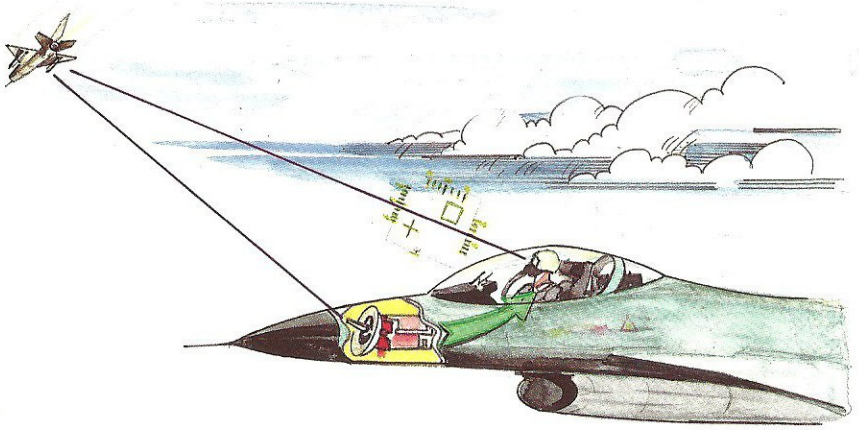
The systems cue targets to the crew



INS

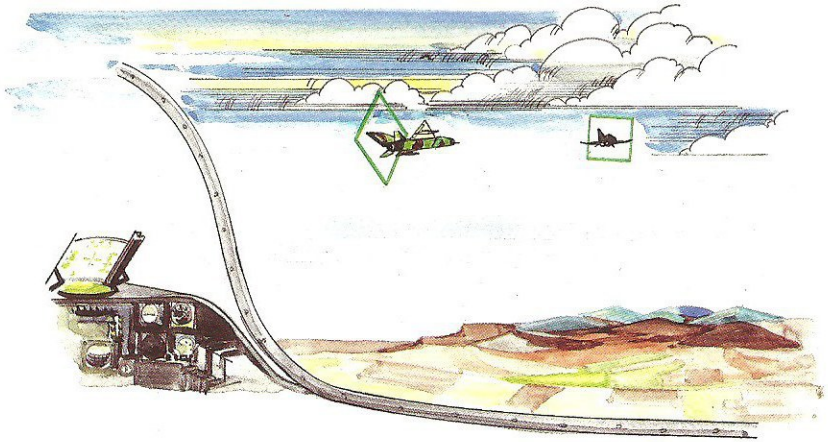
The inertial navigation system (INS) provides the pilot with a ground TD box on the ground target in the full field of view.

Especially efficient in severe operational conditions (high threat environments or circling at high altitude with marginal eye-contact with target area).



Radar

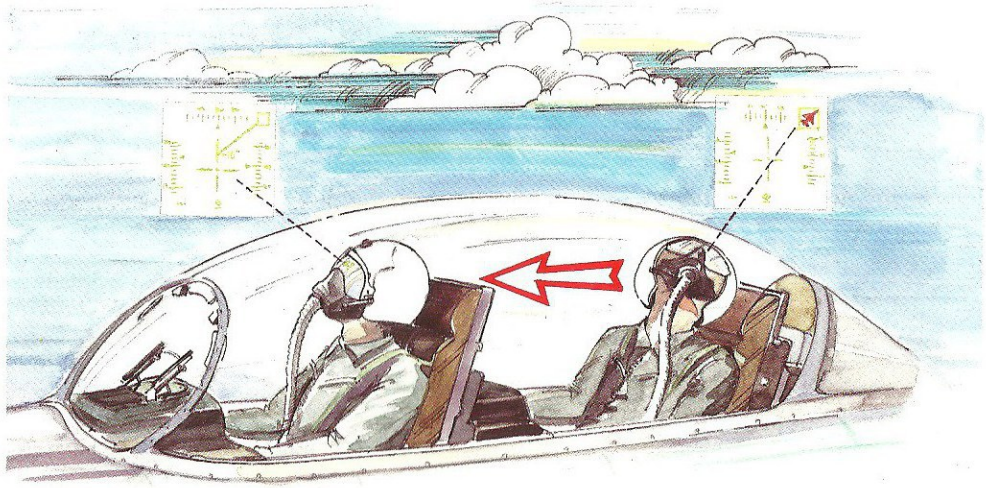
The radar positions a TD-BOX on the enemy aircraft without the need to direct the aircraft and HUD towards the target.



Radar/Missile

In this case, the radar is locked on an F-4; the missile on a MIG-21.

Both are in offset. Still, the pilot receives needed information.



Visual communication between Pilot and Navigator

"I've spotted one at 7 o'clock, closing in on us - attention!"

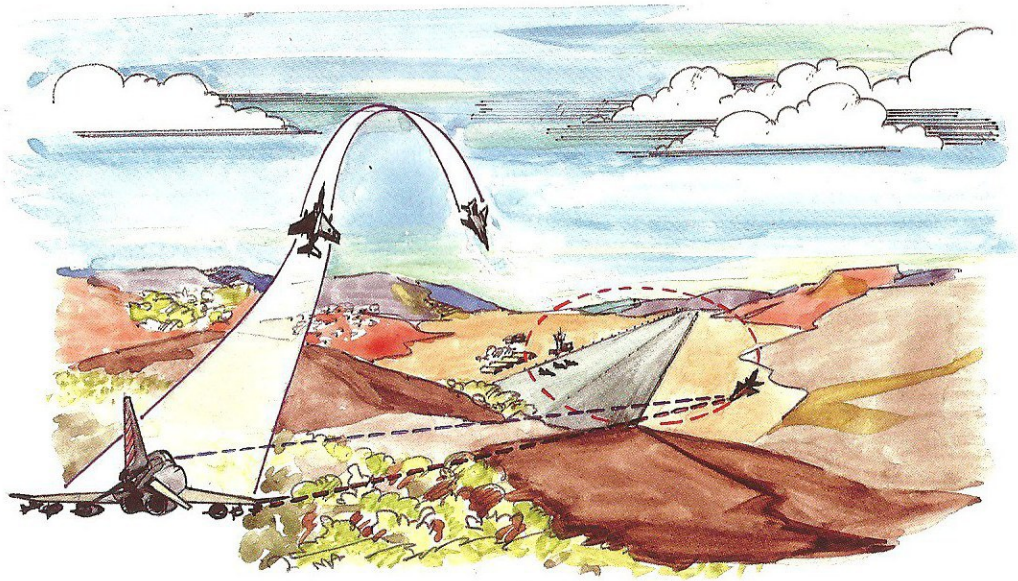
"Tally, taking him, don't see other one; you try and find him"

"I've got the second one - far below, above the brown field next to..."

"Don't elaborate - just guide me to him"

"OK, Get him on the DASH"

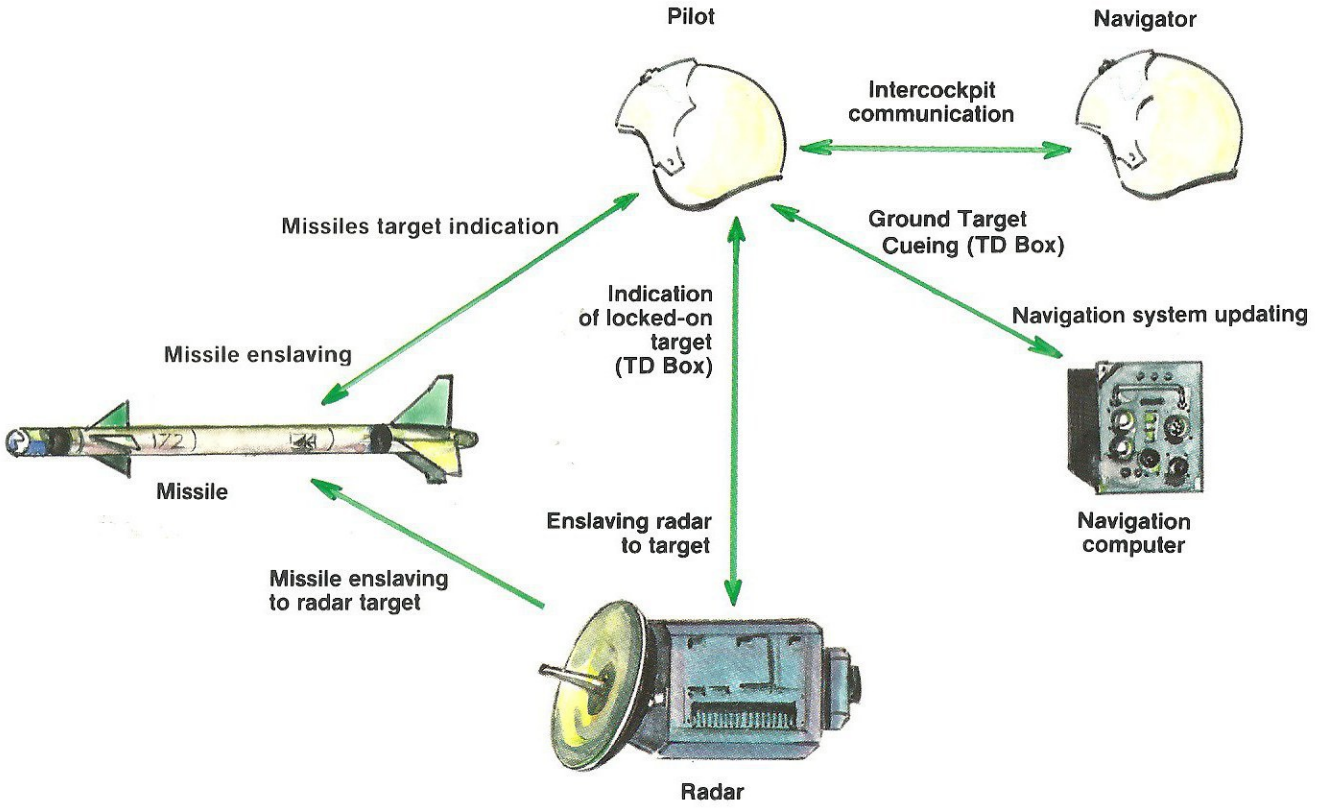
"Tally. I'm going for him! Cover 6 o'clock"



An example of A-A operation during A-G mission

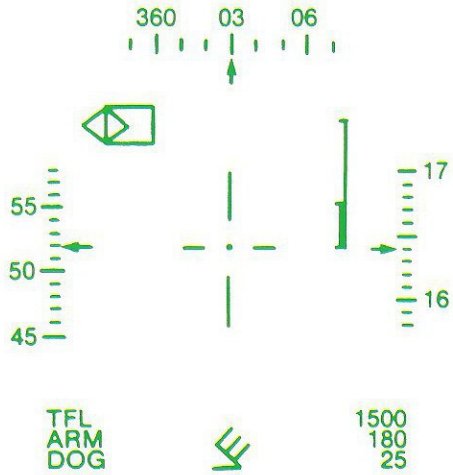
During final approach, the attacking aircraft discerns an enemy aircraft. DASH enables immediate weapon launch at enemy without changing direction or abandoning the mission.

System Operation - Functional Diagram

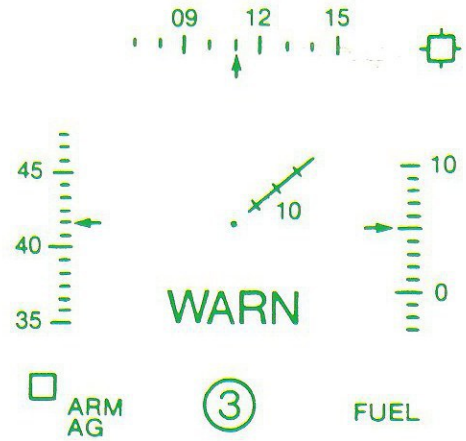


DASH -Displays

A-A



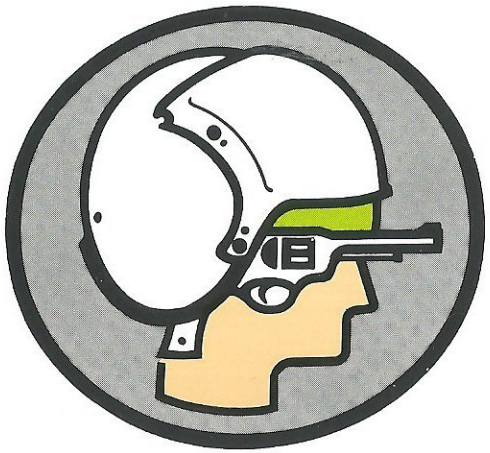
A-G



DASH - Current Status

The first series production system has been operative on board a two-seater F-15 since October 1986

DASH cost, is equal to approximately the price of one air-to-air missile.



Technical Data

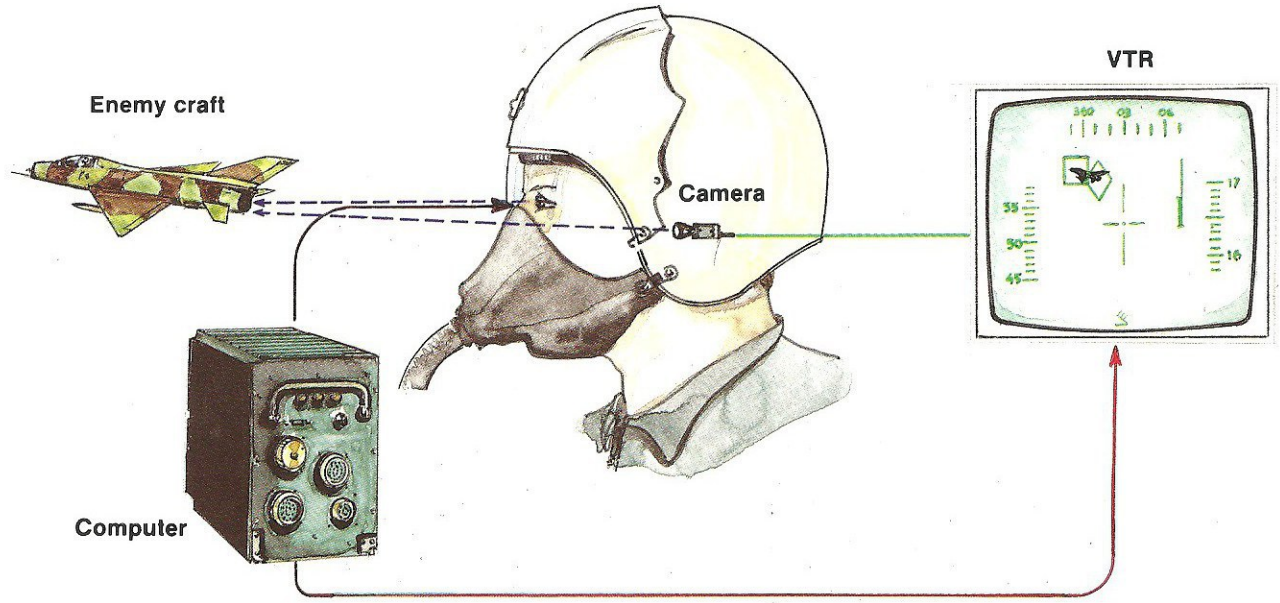
- Instantaneous field of view ..... 12° to 15°
- Angular Coverage
  Azimuth ..... ±160°
  Elevation ..... ±70°
  Roll ..... ±60°
- Resolution ..... 500 TV lines
- Contrast ..... 1.2 at 10,000 ft/l
- Added weight on helmet ..... 150 gr.

Post-Flight Mission Assessment

The need to assess pilot performance and missile launch is important.
Assessing with DASH is unique.

The method: use of videotape recorder (VTR) for outside picture with system data superimposed on it.

- The picture is taken from a miniature video-camera mounted on the helmet parallel to the line of sight.
- System data is retrieved from DASH computer and put on video.
- This way, an almost identical picture to the one the pilot saw in flight is reconstructed.



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1J1
1J3
1J4

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